

### **REMARKS**

Claims 1-40 are pending in this patent application. Reconsideration of the claims is respectfully requested in light of the following remarks.

#### **Rejections Under 35 U.S.C. §103(a), Claims 1-5, 8-10, 15, 20-24, and 27-29**

Claims 1-5, 8-10, 15, 20-24 and 27-29 are rejected under 35 U.S.C. §103(a) as being allegedly unpatentable over Yang, et al. (US Patent No. 6,451,647 hereinafter referred to as "Yang") in view of Ying, et al. (US Patent No. 6,436,838 hereinafter referred to as "Ying"). Applicants traverse this rejection on the grounds that these references are defective in establishing a prima facie case of obviousness with respect to claims 1 and 20.

As the PTO recognizes in MPEP § 2142:

*... The examiner bears the initial burden of factually supporting any prima facie conclusion of obviousness. If the examiner does not produce a prima facie case, the applicant is under no obligation to submit evidence of nonobviousness...*

It is submitted that, in the present case, the examiner has not factually supported a prima facie case of obviousness for the following, mutually exclusive, reasons.

#### **1. Even When Combined, the References Do Not Teach the Claimed Subject Matter**

The Yang and Ying references cannot be applied to reject claims 1-5, 8-10, 15, 20-24 and 27-29 under 35 U.S.C. § 103(a), which provides that:

*A patent may not be obtained ... if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which the subject matter pertains ... (Emphasis added)*

Thus, when evaluating a claim for determining obviousness, all limitations of the claim must be evaluated. However, neither Yang nor Ying discloses "etching through said exposed

portions of said high k dielectric layer with a plasma etch comprised of an inert gas,  $\text{BCl}_3$ , and one or more fluorocarbon gases  $\text{C}_x\text{H}_y\text{F}_z$ , wherein x and z are integers and y is an integer or is 0, or  $\text{CH}_4$ ” as recited in claims 1 and 20.

The examiner alleges that Ying discloses the use of barium trichloride gases with other halogens to plasma etch dielectrics at column 3 and thus disclose the features of claims 1 and 20. Applicants respectfully disagree. At column 3, lines 25-55, Ying discloses that “[t]he plasma etchant species are generated from a plasma source (feed) gas comprising boron trichloride ( $\text{BCl}_3$ ) or silicon tetrachloride ( $\text{SiCl}_4$ ), or a combination thereof. The  $\text{BCl}_3$  or  $\text{SiCl}_4$  principal etchants are frequently used in combination with argon, oxygen, nitrogen, chlorine, or a combination thereof. . . . Other essentially inert gases may be added, for example and not by way of limitation, xenon, krypton, or helium.”

Thus, Ying merely discloses a plasma etchant that comprises  $\text{BCl}_3$  or  $\text{SiCl}_4$  in combination with an inert gas such as argon, oxygen, nitrogen, or chlorine. Ying does not disclose “a plasma etch comprised of an inert gas,  $\text{BCl}_3$ , and one or more fluorocarbon gases  $\text{C}_x\text{H}_y\text{F}_z$ , one or more fluorocarbon gases  $\text{C}_x\text{H}_y\text{F}_z$ , wherein x and z are integers and y is an integer or is 0, or  $\text{CH}_4$ .” There is no disclosure or suggestion in the reference of carbon, hydrogen, or fluorine, let alone one or more fluorocarbon gases  $\text{C}_x\text{H}_y\text{F}_z$ , wherein x and z are integers and y is an integer or is 0, or  $\text{CH}_4$ . Therefore, Ying does not disclose the features of claims 1 and 20.

Yang also does not disclose the features of claims 1 and 20. At column 12, lines 1-10, Yang discloses, “plasma etching the high-K dielectric material, comprises providing a mixture of gases comprising oxygen, a fluorine-containing material and an inert gas. . . . In one embodiment, the fluorine containing material is one or more  $\text{CF}_4$ ,  $\text{C}_2\text{F}_6$ ,  $\text{CHF}_3$ ,  $\text{C}_2\text{HF}_5$ ,  $\text{CH}_2\text{F}_2$ ,  $\text{C}_2\text{H}_2\text{F}_4$ ,  $\text{XeF}_2$ .” Yang merely discloses oxygen, the fluorine-containing material, and the inert gas. Yang does not mention anything about  $\text{BCl}_3$ . Therefore, Yang also does not disclose the features of claims 1 and 20.

In addition, the examiner alleges that it would have been obvious to one of ordinary skill in the art to modify the Yang process by the teachings of Ying reference to use barium trichloride in the plasma in order to increase the selectivity of the etchant gases. Applicants

respectfully disagree. While Ying discloses plasma etchant species that are generated from a plasma source gas comprising  $\text{BCl}_3$  or  $\text{SiCl}_4$ , Ying does not disclose or suggest a plasma source gas that includes one or more fluorocarbon gases  $\text{C}_x\text{H}_y\text{F}_z$ . On the other hand, Yang discloses a plasma etchant that comprises oxygen, fluorine-containing material and an inert gas. But there is no mention of  $\text{BCl}_3$ . Therefore, without some disclosure by the Applicants, one of ordinary skill in the art would not have been led to modify Yang's or Ying's disclosure to include one or more fluorocarbon gases  $\text{C}_x\text{H}_y\text{F}_z$  or  $\text{CH}_4$  and  $\text{BCl}_3$  in a plasma.

Thus, for this mutually exclusive reason, the examiner's burden of factually supporting a *prima facie* case of obviousness has clearly not been met, and the rejection under 35 U.S.C. § 103 should be withdrawn.

## **2. The Combination of References is Improper**

Assuming, arguendo, that none of the above arguments for non-obviousness apply (which is clearly not the case based on the above), there is still another, mutually exclusive, and compelling reason why the Yang and Ying references cannot be applied to reject claims 1-5, 8-10, 15, 20-24 and 27-29 under 35 U.S.C. § 103(a).

§ 2142 of the MPEP also provides:

*...the examiner must step backward in time and into the shoes worn by the hypothetical 'person of ordinary skill in the art' when the invention was unknown and just before it was made.....The examiner must put aside knowledge of the applicant's disclosure, refrain from using hindsight, and consider the subject matter claimed 'as a whole'.*

Here, neither Yang nor Ying discloses, or even suggests, the desirability of the combination of  $\text{BCl}_3$  and one or more fluorocarbon gases  $\text{C}_x\text{H}_y\text{F}_z$ , since neither reference discloses a plasma etch comprised of an inert gas,  $\text{BCl}_3$ , and one or more fluorocarbon gases  $\text{C}_x\text{H}_y\text{F}_z$ , wherein x and z are integers and y is an integer or is 0, or  $\text{CH}_4$ , as recited in claims 1 and 20. Yang merely discloses a plasma that comprises  $\text{BCl}_3$ , but not one or more fluorocarbon gases  $\text{C}_x\text{H}_y\text{F}_z$ , wherein x and z are integers and y is an integer or is 0, or  $\text{CH}_4$ . Yang merely

discloses a plasma etchant that comprises oxygen, a fluorine-containing material and inert gas, but fails to disclose  $\text{BCl}_3$ .

Thus, it is clear that neither reference provides any incentive or motivation supporting the desirability of the combination. Therefore, there is simply no basis in the art for combining the references to support a 35 U.S.C. § 103(a) rejection. In addition, even, arguendo, if one of ordinary skill in the art were to combine the disclosures of Yang and Ying, the resulting combination still would not be a plasma etch comprised of an inert gas,  $\text{BCl}_3$ , and one or more fluorocarbon gases  $\text{C}_x\text{H}_y\text{F}_z$ , wherein x and z are integers and y is an integer or is 0, or  $\text{CH}_4$ , since neither Ying nor Yang discloses the desirability to combine  $\text{BCl}_3$  and one or more fluorocarbon gases  $\text{C}_x\text{H}_y\text{F}_z$ .

In this context, the MPEP further provides at § 2143.01:

*The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination.*

In the above context, the courts have repeatedly held that obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching, suggestion or incentive supporting the combination.

In the present case it is clear that the examiner's combination arises solely from hindsight based on the invention without any showing, suggestion, incentive or motivation in either reference for the combination as applied to claims 1 and 20. For example, on page 16 of the current specification, it states that "the inventor have discovered that a gas combination which includes  $\text{BCl}_3$  an inert gas such as Ar, He, Ne, or Xe, and one or more fluorocarbon ( $\text{C}_x\text{H}_y\text{F}_z$ ) gases where x and z are integers and y is an integer or is 0 is especially effective in forming a plasma in an etch chamber that will remove the high k dielectric layer 22 without forming high k dielectric residues or damaging substrate 20 or STI features 21." Since neither Ying nor Yang discloses the combination of  $\text{BCl}_3$  and one or more fluorocarbon gases  $\text{C}_x\text{H}_y\text{F}_z$ , Applicants specifically submit that the examiner's combination arises solely from hindsight based on the invention.

Therefore, for this mutually exclusive reason, the examiner's burden of factually supporting a *prima facie* case of obviousness has clearly not been met, and the rejection to claims 1-5, 8-10, 15, 20-24 and 27-29 under 35 U.S.C. §103(a) should be withdrawn.

**Conclusion**

It is clear from all of the foregoing that independent claims 1 and 20 are in condition for allowance. Dependent claims 2-19 and 21-40 depend from and further limit independent claims 1 and 20 and therefore are allowable as well.

An early formal notice of allowance of claims 1-40 is requested.

Respectfully submitted,



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